

REMARKS

Claims 1-16 and 18-20 are pending. By this amendment, claim 17 is cancelled without prejudice or disclaimer and claims 18-20 are added. Reconsideration in view of the above amendments and following remarks is respectfully requested.

The drawings were objected to under 35 C.F.R. §1.83(a). Claim 17 has been cancelled, thus rendering moot the objection.

Claims 1-3, 6, 7, 10, 12 and 14-17 were rejected under 35 U.S.C. §103(a) over Nishi (U.S. Patent 5,243,195) in view of Ferraro et al. and claims 1-4, 6-8 10, 12 and 14-17 were rejected under 35 U.S.C. §103(a) over Van Den Brink (U.S. Patent 5,801,832) in view of Ferraro et al. The rejections are respectfully traversed.

Claim 1 recites a lithographic projection apparatus including a first object table for holding a projection beam patterning device which patterns the projection beam, a second object table for holding a substrate, a projection system which images the patterned beam onto a target portion of the substrate, a reference frame and position detecting device including a radiation source mounted on the reference frame, a two-dimensional radiation detector mounted in a fixed position on the reference frame and a mirroring device mounted on one of the object tables that is movable relative to the reference frame so as to reflect radiation emitted by the radiation source toward the radiation detector.

The July 18, 2002 Office Action on page 2, paragraph number 3 states that Nishi discloses three position detection devices IFX, IFY1 and IFY2. It is respectfully submitted, however, that the interferometers of Nishi are not position detecting devices as alleged in the Office Action.

As discussed, for example, on page 3, lines 27-34 of the instant application, the position of movable parts of a lithographic apparatus are typically determined by the use of incremental sensors, such as encoders or interferometers, and an additional zero reference sensor, which detects when the movable object is at the reference or zero position, to provide a basis from which the incremental measurements can be used to calculate an absolute position. As disclosed, for example, on page 4, lines 17-34 of the instant application, a position detecting device according to claim 1 which includes a radiation source mounted on the reference frame, a two-dimensional detector mounted in a fixed position on the reference frame and a mirroring device mounted on one of the object tables that is movable relative to the reference frame so as to reflect radiation emitted by the radiation source toward the

radiation detector can measure the position of the object table in two degrees of freedom. Accordingly, it is not necessary to provide an additional zero reference sensor. Nishi provides the fiducial marks FM1 and FM2 on the fiducial plate FP fixed to the wafer table WST so that the fiducial marks FM1 and FM2 can be detected by the off-axis wafer alignment system 4A, 4B and 4C while fiducial mark FM2 can be detected by the through the reticle (TTR) alignment system 1A and 1B or the through the lens (TTL) alignment system 2X and 3X, 2Y and 3Y. In other words, the interferometers IFX, IFY1 and IFY2 do not detect a position of the wafer stage WST, they merely determine a change of position of the wafer stage WST after it has been aligned by the various alignment systems. The system of Nishi is thus nothing more than what is disclosed as the prior art in Applicants' specification on page 3, lines 27-34.

It is also respectfully submitted that Van Den Brink also fails to disclose or suggest a position detection as recited in claim 1. As clearly disclosed, for example, in column 9, lines 49-62, Van Den Brink also disclose nothing more than a known prior art system in which an alignment device uses two alignment beams b and b' for aligning a substrate alignment mark P2 on a mask alignment mark M2, and substrate alignment mark P1 on a mask alignment mark M1. The various interferometers of Van Den Brink do nothing more than measure a change in position from an aligned position. They do not detect a position of the substrate table.

It is respectfully submitted that there is no motivation to combine Ferraro et al. with either Nishi or Van Den Brink, as alleged in the Office Action. As discussed above, both Nishi and Van Den Brink are typical prior art systems in which an alignment system is used to determine a reference, or zero position and interferometers are used to measure an incremental change from the reference or zero position. Regardless of whether motivation exists to combine Ferraro et al. with either Nishi or Van Den Brink, the combination still fails to result in the invention of claim 1 as the provision of, for example, a CCD camera to the interferometers of Nishi and/or Van Den Brink does not change their operation, they remain alignment systems requiring both a zero position sensor and an incremental sensor.

Claim 12 recites a method of manufacturing a device including determining a reference position of an object table relative to a reference frame by emitting radiation source mounted on the reference frame toward mirroring device mounted on the object table,

reflecting the radiation, and detecting the reflected radiation in a two-dimensional radiation detector mounted in a fixed position on the reference frame.

As discussed above, Nishi and Van Den Brink disclose alignment systems in which marks on the wafer and the mask are detected to provide a reference, or zero position. There is no disclosure or suggestion by either Nishi or Van Den Brink of determining a reference position of an object table relative to a reference frame by emitting radiation from a radiation source mounted on the reference frame toward a mirroring device mounted on the object table, reflecting the radiation, and detecting the reflected radiation in a two-dimensional radiation detector mounted in a fixed position on the reference frame. The interferometers of Nishi and Van Den Brink merely determine a change from the reference or zero position after the reference or zero position is determined by the alignment marks, the interferometers do not determine a reference position. It is further respectfully submitted that the combination of either Nishi or Van Den Brink with Ferraro et al. fails to result in the invention of claim 12 for the reasons discussed above with respect to claim 1.

Claim 15 recites the sub-combination of the position detecting device of claim 1 and claim 16 recites a sub-combination of the method of determining a reference position of claim 12 and are allowable for the same reasons discussed above with respect to claims 1 and 12 respectfully.

Claims 2-4, 6-10, 12 and 14 recite additional features of the invention and are allowable for the same reasons discussed above with respect to claims 1, 12, 15 and 16 and for the additional recited therein.

Reconsideration and withdrawal of the rejection of claims 1-3, 6, 7, 10, 12 and 14-16 under 35 U.S.C. §103(a) over Nishi in view of Ferraro et al. and the rejection of claims 1-4, 6-8 10, 12 and 14-17 under 35 U.S.C. §103(a) over Van Den Brink (U.S. Patent 5,801,832) in view of Ferraro et al. are respectfully requested.

Claim 5 was rejected under 35 U.S.C. §103(a) over Nishi in view of Ferraro et al. and further in view of Gallagher (U.S. Patent 5,811,816). The rejection is respectfully traversed.

Claim 5 recites additional features of the invention and is allowable for the same reasons discussed above with respect to claim 1 and for the additional features recited. In addition, it is respectfully submitted that Gallagher et al. fails to cure the deficiencies of Nishi and Ferraro et al. with respect to claim 1 and any combination of Nishi, Ferraro et al. and Gallagher et al. will fail to result in the invention of claim 1.

Reconsideration and withdrawal of the rejection of claim 5 under 35 U.S.C. §103(a) over Nishi in view of Ferraro et al. and Gallagher et al. are respectfully requested.

Claim 18 recites a lithographic projection apparatus including a position detecting system including three position detection devices, each position detecting device including a radiation source mounted on a reference frame, a two-dimensional radiation detector mounted in a fixed position on the reference frame, and a mirroring device mounted on one of the object tables that is movable relative to the reference frame so as to reflect radiation emitted by the radiation source toward the radiation detector, wherein the three position detecting devices are arranged non-parallel to each other.

As disclosed, for example, on page 10, lines 21-32 of the instant application, the positions of the radiation source/detector units on the reference frame and the reflectors on the table are such that the table can be moved to a position where zero outputs are given for all six degrees of freedom simultaneously. As discussed above, as neither Nishi nor Van Den Brink disclose a position detecting device as recited in claim 18, neither Nishi nor Van Den Brink can disclose or suggest a position detecting system including three position detection devices, wherein the three position detecting devices are arranged non-parallel to each other. It is also respectfully submitted that as discussed above, the combination of Ferraro et al. with either Nishi or Van Den Brink fails to result in a position detection device as recited in claim 18, as thus also would fail to result in a position detecting system including three position detection devices as recited in claim 18.


Claims 19 and 20 recited additional features of the invention and are allowable for the same reasons discussed above with respect to claim 18 and for the additional features recited therein.

Applicants appreciated the indication that claims 11 and 13 define patentable subject matter. However, in view of the amendments and remarks, it is respectfully submitted that all of the claims are allowable and that the entire application is in condition for allowance.

Should the examiner believe that anything further is desirable to place the application in better condition for allowance, the examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,
Pillsbury Winthrop LLP

By: _____


John P. Darling
Reg. No.: 44,482
Tel. No.: (703) 905-2045
Fax No.: (703) 905-2500

JPD\tmt

P.O. Box 10500
McLean, VA 22102

(703) 905-2000